Enrollment No: _____ Exam Seat No: _____

C.U.SHAH UNIVERSITY
Winter Examination-2015

Subject Name: Analog Electronics Circuits

Subject Code: 4TE03AEC1 **Branch: B.Tech (EE,EEE,IC)**

Semester: 3 Date: 03/12/2015 Time: 2:30 To 5:30 Marks: 70

Instructions:

(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1 **Attempt the following questions:** **(14)**

a) In a full wave rectifier circuit with centre tap transformer, if peak voltage between one end of secondary winding and centre tap is 150 V, then peak inverse voltage (PIV) is _____

(I) 300 V(II)75 V (III) 150 V (IV)212 V

b) In a full wave bridge rectifier circuit, diode resistance $R_f = 100\ \Omega$, secondary winding resistance$R_s = 30\ \Omega$ and load resistance$R_L = 10\ k\Omega$. What will be the percentage voltage regulation for the rectifier?

(I) 1.3 % (II) 2.3 %(III) 0.1 %(IV) 3.3 %

c) Which power amplifier provides output signal for only 180°or one half of the input signal cycle?

(I) Class AB (II) Class A (III) Class C (IV) Class B

d) What will be the effective load resistance at the primary side of 15:1 transformer connected to an 8 Ω load?

(I) 3.6 $k\Omega$(II) 1.8 $k\Omega$(III) 960 Ω(IV) 225 Ω

e) For a common emitter hybrid-pi model, value of internal base to collector capacitance $C_{b'c} = 4\ pF$, internal base to emitter capacitance $C_{b'e} = 27\ pF$ and internal base to emitter resistance $r_{b'e} = 860\ \Omega$.What will be short circuit small signal forward current transfer ratio f_β?

(I) 46.28 MHz(II) 5.97 MHz(III) 185 MHz(IV) 26 MHz

f) For a common emitter amplifier, if A_V is voltage gain and A_i is current gain, which one is the correct option?

(I) $A_V > 1, A_i < 1$(II)$A_V < 1, A_i < 1$

(III) $A_V < 1, A_i > 1$(IV)$A_V > 1, A_i > 1$

g) An amplifier has bandwidth without feedback $BW = 40\ kHz$ and a gain of 50. If 5% of negative feedback is provided, what will be the bandwidth with feedback?

(I) 11 kHz(II) 140 kHz(III) 40 kHz(IV) 60 kHz

h) Which one of this BJT biasing circuit is β (h_{fe}) independent?

(I) Voltage Divider Bias (II)Fixed Bias

(III) Collector to Base Bias(IV)Both (I) and (III)

i) What will be the size of emitter bypass capacitor for CE amplifier to provide a low frequency 3 dB point at $250\ Hz$, when emitter resistance $R_e = 1\ k\Omega$, $h_{fe} = 50$, $h_{ie} = 1k\Omega$, source resistance $R_s = 600\ \Omega$?

(I) 47 μF(II)10 μF(III) 20 μF(IV) 50 μF

j) For a sinusoidal oscillator circuit, what is the Barkhausen criteria for oscillator circuit?

(I) $\beta A < 1$(II)$\beta A = 1$ (III) $\beta A = -1$(IV) $\beta A = 0$

k) In a Hartley's oscillator circuit $L_1 = 1\ mH, L_2 = 100\ \mu H, M = 50\ \mu H$ and $C = 100\ pF$. What will be the frequency of oscillation?

(I) 503 kHz(II) 1.15 MHz(III) 459 kHz(IV) 13 kHz

l) An input voltage $v_{in} = 20\ mV$ is applied at inverting terminal of the op-amp having open loop gain 200,000. What will be the output voltage?

(I) -4000 V (II) 4000 V (III) 10,000 V (IV)-10,000 V

m) For an ideal operational amplifier which one is the false statement?

(I) Infinite input resistance (II)Zero output resistance

(III) Infinite Voltage Gain (IV)Zero input resistance

n) If I_{B1} and I_{B2} are the base bias current of op-amp, then what will be the input offset current I_{io} of op-amp?

(I) $\frac{I_{B1}+I_{B2}}{2}$(II)$|I_{B1} - I_{B2}|$(III) $|I_{B1} + I_{B2}|$(IV)$\frac{I_{B1}-I_{B2}}{I_{B1}+I_{B2}}$

Attempt any four questions from Q-2 to Q-8

Q-2 **Attempt all questions** **(14)**

(a) Draw the circuit diagram of full wave bridge wave rectifier with capacitor filter and explain its operation. Draw the waveforms of supply voltage, load voltage, load current and capacitor current. **07**

(b) Calculate the range of input voltage of zener shunt regulator for which output voltage will remain constant. Zener regulator circuit has following specifications: **07**

Output Voltage $V_o = 5\ V$ Series Resistance $R_s = 1.5\ k\Omega$

Load Resistance $R_L = 2.2\ k\Omega$ Zener Minimum Current = $1\ mA$

Zener Maximum Current = $20\ mA$

Q-3 **Attempt all questions** **(14)**

(a) A full wave bridge rectifier is operated from $230\ V\ (rms)$ with $50\ Hz$ supply. It is connected to a load resistance of $470\ \Omega$ and $470\ \mu F$ filter capacitor. Calculate **07**

(i) Average DC load voltage

(ii) Peak to peak ripple voltage and Peak ripple voltage

(iii) Minimum value of load voltage

(iv) Ripple Factor

(b) Explain collector to base bias circuit for BJT. **07**

Q-4 **Attempt all questions** **(14)**

(a) Draw low frequency model (h-parameter model) for common emitter amplifier and explain the effect of emitter bypass capacitor an amplifier voltage gain by deriving the equation $\left|\frac{A_{v(LF)}}{A_{v(MF)}}\right| = \frac{1}{\sqrt{2}}$. Where, $A_{v(LF)}$= Low frequency voltage gain and $A_{v(MF)}$=Mid frequency voltage gain. **07**

(b) Draw circuit diagram of Class B push pull amplifier and explain its operation. Show the output voltage and current swing in the transistor characteristics. **07**

Q-5 **Attempt all questions** **(14)**

(a) A transistor is used in a CE amplifier at a quiescent collector current of 1 mA. If the load resistance (collector resistance) is $6.8\,k\Omega$ and the source resistance is considered to be negligible. The h parameters value for given transistor are$h_{ie} = 6400\ \Omega$,$h_{fe} = 240$ and$h_{re} = 1.5 \times 10^{-4}$,$\frac{1}{h_{oe}} = 166\ k\Omega$.Calculate the following parameters. **07**

(i) Current Gain (iii)Voltage Gain

(ii) Input resistance (iv) Power Gain

(b) Draw the Hybrid-pi model of common emitter amplifier and derive the equation for short circuit current gain. **07**

Q-6 **Attempt all questions** **(14)**

(a) Draw the circuit diagram of Wein Bridge oscillator circuit and obtain the condition $f = \frac{1}{2\pi RC}$ for sustained oscillation. **07**

(b) Calculate the following parameters for a current series feedback amplifier having open loop gain $A = 300$, input resistance without feedback $R_i = 1.5\ k\Omega$, output resistance without feedback $R_o = 50\ k\Omega$ and feedback factor β=10 %. Calculate **07**

(i) Gain (ii) Input Resistance (iii) Output Resistance

Q-7 **Attempt all questions** **(14)**

(a) A three section RC phase shift oscillator has $R = 10\ k\Omega$ and $C = 0.01\ \mu F$. **07**

(i) What is the frequency of oscillation?

(ii) If the oscillator is to be made variable of using the same value of R, what should be the tuning range of capacitor to obtain a frequency range from $1\ kHz$ to $100\ kHz$?

(b) Draw the block diagram of feedback amplifier and explain function of each block. **07**

Q-8 **Attempt all questions** **(14)**

(a) Explain the operation of Astable multivibrator with necessary waveforms. **07**

(b) Explain the following modes of operational amplifier for open loop configuration. **07**

(i) Differential Amplifier (ii) Inverting Amplifier (iii) Non-inverting Amplifier